CLAIMS

What is claimed is:

1. A method for forming a free standing micro-structural member comprising the steps of:

providing a substrate;

forming a first sacrificial resist layer over the substrate;

patterning the first sacrificial resist layer to form a first resist portion;

subjecting the first resist portion to at least a first hard bake process to form the first resist portion having a first volume;

forming at least a second sacrificial resist layer followed by patterning and conducting at least a second hard bake process to form a final resist portion having a final volume; and,

depositing at least one structural material layer over the final resist portion.

2. The method of claim 1, wherein the at least a first hard bake process further comprises one of a prior or at least partially simultaneous exposure to polymeric cross-linking inducing radiant energy.

3. The method of claim 2, wherein the radiant energy comprises ultraviolet light having a wavelength of less than about 350 nm.

4. The method of claim 2, wherein the ultraviolet light further comprises a radiation intensity between 50 mJ/cm^2 and 200 mJ/cm^2, a radiation temperature between 150 °C and 250 °C, and a radiation time between 10 and 60 minutes.

5. The method of claim 2, wherein exposure to the polymeric cross-linking inducing radiant energy is carried out prior to the hard bake step comprising a thermal heating step.

6. The method of claim 2, wherein exposure to the polymeric cross-linking inducing radiant energy is carried out at least during a portion of the hard bake process.

7. The method of claim 1, wherein the hard bake process comprises a baking temperature of from about 250 °C to about 350 °C.

8. The method of claim 1, wherein the first smaller volume is smaller compared to the desired final resist portion volume by about 5 % to about 50 %.

9. The method of claim 1, further comprising the step of removing resist comprising the final resist portion according to at least one of an ashing process and a wet stripping process to form a free-standing structural member.

10. The method of claim 1, wherein the structural material is selected from the group consisting of metals, nitrides, oxides, carbides, and titanates.

11. The method of claim 1, wherein the structural material is selected from the group consisting of metals, metal nitrides, refractory metals, refractory metal nitrides, oxides, carbides, and piezo-electric oxides.

12. A method for forming a free standing micro-structural member comprising the steps of:

providing a substrate;

forming a first sacrificial resist layer over the substrate;

patterning the first sacrificial resist layer to form a first resist portion;

subjecting the first resist portion to at least a first post treatment process to form the first resist portion having a first volume;

forming at least a second sacrificial resist layer followed by patterning and conducting at least a second post treatment process to form a final resist portion having a final volume; and,

depositing at least one structural material layer over the final resist portion.

13. A method for forming a free standing micro-structural member over a resist portion with improved dimensional tolerances comprising the steps of:

providing a substrate;

forming a first resist layer over the substrate;

patterning the first resist layer to form a first resist portion having a predetermined first volume smaller compared to a predetermined final resist portion volume;

subjecting the first resist portion to a first curing process comprising deep UV irradiation and thermal heating for a predetermined period to harden the first resist portion;

forming at least a second resist layer having a predetermined thickness over the first resist portion followed by patterning and a second curing process to form the final resist portion volume;

depositing at least one structural material layer over the final resist portion; and,

removing the final resist portion according to at least one of an ashing and a wet stripping process to form a free standing structural member.

14. The method of claim 13, wherein the first and second curing processes comprise exposure to the deep UV irradiation prior to the thermal heating period.

15. The method of claim 13, wherein the first and second curing processes comprise exposure to the deep UV irradiation during at least a portion of the thermal heating period.

16. The method of claim 13, wherein the thermal heating period comprises a temperature of from about 250 °C to about 350 °C.

17. The method of claim 13, wherein the first volume is smaller compared to the final resist portion volume by about 5 % to about 50 %.

18. The method of claim 13, wherein the first volume is smaller compared to the final resist portion volume from about 10% to about 33%.

19. The method of claim 13, wherein the first smaller volume comprises sidewall portions formed having a smaller dimension by a factor of about 1/2 compared to a smaller thickness dimension.

20. The method of claim 13, wherein the structural material is selected from the group consisting of metals, metal nitrides, refractory metals, refractory metal nitrides, oxides, carbides, and metal titanates.